



Project: J 01229
Noise Impact Assessment:
Proposed Dwelling – Rear of 7 North Close

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CONTENTS

Section		Page Number
1	BACKGROUND	3
2	ASSESSMENT CRITERIA	4 - 7
3	METHODOLOGY	7 - 9
4	INSTRUMENTATION	9
5	RESULTS	10 - 12
6	DISCUSSION	12, 13
7	NOISE MITIGATION	14 - 16
8	CONCLUSIONS	16, 17
	APPENDIX 1 – Glossary of Terms	18 - 21
	APPENDIX 2 – Site Location	22
	APPENDIX 3 – Site Photographs	23
	APPENDIX 4 – Ambient Noise Levels	24 - 35
	APPENDIX 5 – Transfer Functions	36
	APPENDIX 6 – Mechanical Ventilation	37
	APPENDIX 7 – Glazing Performance	38



1.0 BACKGROUND

- 1.1 The planning application concerns a proposed residential dwelling located on land to the rear of 7 North Close, Havant PO9 2TE.
- 1.2 The proposed site is in close proximity to a raised section of the A27. See APPENDIX 2 – Site Location.
- 1.3 Applications for this location are assessed by Havant Borough Council (HBC).
- 1.4 HBC requires a noise assessment to be carried out in order to achieve recommended internal noise levels within any proposed new dwellings.
- 1.5 Relevant national standards and guidance should be referenced with regard to measurement methodology, measurement equipment and assessment criteria.
- 1.6 Sound Planning limited have been retained to conduct a noise assessment and issue an acoustic report in accordance with HBC's planning conditions.
- 1.7 The design of the building shall include an adequate form of sound insulation in consideration of predicted internal noise levels.
- 1.8 Sound Planning will conduct an environmental noise assessment in accordance with The National Planning Policy Framework (March 2012) and calculate internal noise level in accordance with BS 8233: 1999¹.
- 1.9 Sound Planning may also make reference to Noise Exposure Categories (NEC's) found in the superseded policy PPG24² due to continued recognition of the value of these categorisations.

¹ British Standard 8233: 1999 – *Sound insulation and noise reduction for buildings* – Code of practice.

² Planning Policy Guidance 24 – *Planning and noise*.



2.0 ASSESSMENT CRITERIA

The noise assessment and acoustic report should be carried out in accordance with relevant standards and guidelines in conjunction with the Local Authority's validation SPD.

2.1 The National Planning Policy Framework (March 2012)

2.1.1 The National Planning Policy Framework (March 2012) states that planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.1.2 Effective land use planning can help prevent or mitigate potential noise impacts. The express inclusion of noise in the National Planning Policy Framework means that it will be a material consideration in local planning decisions. Where noise may be an issue, a noise impact assessment may be required as an integral part of the process for making those decisions and should be sought at the earliest possible stage of the planning process.

2.1.3 By avoiding the location of noise sensitive uses near to noise-producing premises, noise problems can often be prevented. Where this is not possible, noise controls need to be incorporated into new noise-producing developments and mitigation measures may be prudent for new noise sensitive developments such as housing, schools, hospitals, nursing homes and places of worship.



2.1.4 It is an important function of the environmental health service to contribute to a local authority's land use planning functions by providing professional and technical support and expert advice on noise, which may include:

- drafting policies relating to noise for local development plans;
- assessing the localised noise impacts of new development proposals by vetting planning applications and drafting appropriate planning conditions and informal guidance;
- contributing to the decision making process by preparing or contributing to committee reports and attending committee meetings where necessary; and
- providing technical input into the assessment of compliance with planning conditions relating to noise, and contributing to the planning enforcement process.

2.1.5 While a grant of planning consent cannot excuse any nuisance subsequently caused by the development, applicants for schemes which may give rise to noise issues are strongly advised to discuss their proposals with their local environmental health department at an early stage.

2.2 Planning Policy Guidance 24 (superseded policy)

2.2.1 The National Planning Policy Framework supersedes Planning Policy Guidance 24 – *Planning and noise* (PPG24).

2.2.2 However PPG24's assessment methodologies and the categorisation of sites using Noise Exposure Categories (NEC) remain in use within local authority development plans.

2.2.3 Planning Policy Guidance 24: *Planning and Noise*

Noise Levels Corresponding to Noise Exposure Category $L_{Aeq,T}$ for New Dwellings ³				
	Noise Exposure Category			
Time Period	A	B	C	D
	Road Traffic			
0700 - 2300	<55	55 - 63	63 - 72	>72
2300 - 0700 ⁴	<45	45 - 57	57 - 66	>66
	Mixed Sources			
0700 - 2300	<55	55 - 63	63 - 72	>72
2300 - 0700	<45	45 - 57	57 - 66	>66

2.3 British Standard 7445-1: 2003⁵

2.3.1 The methods and procedures described in BS 7445 are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site.

2.3.2 The aim of the BS 7445 series is to provide authorities with material for the description of noise in community environments. Based on the principles described in this standard, acceptable limits of noise can be specified and compliance with these limits can be controlled.

2.3.3 BS 7445 does not specify limits for environmental noise.

³ The noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representative of typical conditions.

⁴ Night time noise levels: (2300 - 0700) Sites where individual noise events regularly exceed 82dB L_{Amax} ('S' (slow) time weighting) several times in any hour should be treated as being in NEC 'C', regardless of the $L_{Aeq,8h}$ (except where the $L_{Aeq,8h}$ already puts the site in NEC 'D').

⁵ Description and measurement of environmental noise. Part 1 – Guide to quantities and procedures.

2.4 British Standard 8233: 1999⁶

2.4.1 BS 8233: 1999 is the *Sound insulation and noise reduction for buildings – Code of practice*.

2.4.2 Design Criteria Table⁷

Criterion	Typical Situations	Design Range $L_{Aeq, T}$ dB	
		Good	Reasonable
<i>Reasonable industrial working conditions</i>	Heavy Engineering Light Engineering Garages, Warehouses	70 65 65	80 75 75
<i>Reasonable speech or telephone conversations</i>	Department Store Cafeteria, Canteen, Kitchen Wash Room, Toilet Corridor	50 50 45 45	55 55 55 55
<i>Reasonable conditions for study and work requiring concentration</i>	Library, Cellular Office, Museum Staff Room Meeting Room, Executive Office	40 35 35	50 45 40
<i>Reasonable listening conditions</i>	Classroom Church, Lecture Theatre, Cinema Concert Hall, Theatre Recording Studio	35 30 25 20	40 35 30 25
<i>Reasonable resting/sleeping conditions</i>	Living Rooms Bedrooms	30 30	40 35

3.0 METHODOLOGY

3.1 Sound Planning conducted environmental noise measurements in accordance with BS 7445: 2003⁸.

⁶ British Standard 8233: 1999 – *Sound insulation and noise reduction for buildings – Code of practice*.

⁷ Havant Borough Council – Environmental Health have advised that the ‘Reasonable’ standard should be achieved.

⁸ British Standard BS 7445-1: 2003. *Description and measurement of environmental noise*. ISBN 0 580 43032 4



3.2 Extended Noise Measurements

3.2.1 A Type 1 sound level meter with frequency analysis was installed at ground floor level (1.5m) from Thursday 18th to Monday 22nd October.

3.2.2 The sound level meter (SLM) measured A-weighted maximum (L_{Amax}) and Equivalent Continuous (L_{Aeq}) levels for continuous 15 minute periods throughout the measurement period.

3.2.3 The SLM also performed octave band analysis during the measurement period.

3.3 Satellite Measurement Position

A 'satellite' microphone position was selected to be representative of 1st floor level windows; this was deemed appropriate due to the elevated nature of the A27 at this location.

3.3.1 Noise measurements were undertaken at a microphone height of 4m using a second microphone and sound level meter. The *satellite* measurement was conducted over a 15 minute period running contemporaneously with the extended ground floor microphone position.

3.3.2 The *Satellite* and *Fixed* position results were then compared and a transfer function could then be applied to the extended ground floor microphone position measurement results in order to provide comparative 16 hour and 8 hour levels.

3.4 The microphones were protected with wind/weather shields⁹ and had a clear line of sight to the A27.

3.5 Internal noise level calculations are based on calculation methods laid out in paragraph 6.7 of BS 8233: 1999.

3.6 The highest maximum level L_{max} during the night time period was selected to evaluate potential sleep disturbance.

⁹ See Section 4.0 – Instrumentation.

- 3.7 Internal noise level calculations utilise sound reduction data from OEM¹⁰ laboratory test data sheets i.e. glazing, ventilation manufacturers; and typical sound reduction data from ADE 2003¹¹ for composite wall and roof/ceiling systems.

4.0 INSTRUMENTATION

4.1 Sound Level Meters

Equipment	Make	Model	Class	Serial Number	UKAS Calibration
SLM	Casella	CEL 490	1	077856	4641 (30/3/11)
SLM	Casella	CEL 490	1	128950	4642 (30/3/11)

4.2 Calibrators

Equipment	Make	Model	Class	Serial Number	UKAS Calibration
Field Calibrator	Casella	CEL 110/1	1	077948	4640 (29/3/11)

The Sound Level Meter (SLM) was field calibrated before and after the on-site noise assessments. No deviation was detected (1kHz).

4.3 Other Equipment

Equipment	Make	Model	Class	Serial Number	UKAS Calibration
Environmental Tripod (1.5m)					
Environmental Tripod (7m)					
Wind/Weather Shields					
Laser Measurer	Leica	Disto A5		1073750838	
Digital Camera	Samsung				
Battery Kits					

¹⁰ Original Equipment Manufacturer.

¹¹ Annex C – Draft version of ADE 2003 – Cited Watson et al. *The Little Red Book of Acoustics*. BTA 2007.



5.0 RESULTS

5.1 Microphone Positions – Average Noise Levels (L_{Aeq})

Day of Week	Day/Night	Ground Floor	1st Floor ¹²
		Level	Level
		dB $L_{Aeq, T}$	dB $L_{Aeq, T}$
Thursday	Day	63.2	64.7
	Night	57.0	58.5
Friday	Day	63.8	65.3
	Night	55.3	56.8
Saturday	Day	62.3	63.8
	Night	55.0	56.5
Sunday	Day	61.2	62.7
	Night	55.5	57.0
Monday	Day	62.1	63.6

5.2 Noise Exposure Categories (NEC)¹³

Day of Week	Day/Night	Ground Floor	1st Floor
		NEC	NEC
Thursday	Day	C	C
	Night	C	C
Friday	Day	C	C
	Night	B	C
Saturday	Day	B	C
	Night	B	C
Sunday	Day	B	C
	Night	B	C
Monday	Day	B	C

¹² Based on applied transfer function – See APPENDIX 5.

¹³ PPG24.

5.3 Maximum Levels (L_{Amax})

Day of Week	Day/Night	Ground Floor	1st Floor ¹⁴
		Level (to 1DP)	Level (to 1DP)
		dB L_{Amax}	dB L_{Amax}
Thursday	Day	77	79
	Night	78	80
Friday	Day	74	76
	Night	67	69
Saturday	Day	75	77
	Night	71	73
Sunday	Day	75	77
	Night	67	69
Monday	Day	88	90

5.4 Times 82 dB L_{Amax} Exceeded (night time)

Position	Night v Number of Times 82 dB L_{Amax} Exceeded			
	Thursday	Friday	Saturday	Sunday
	<i>Night</i>	<i>Night</i>	<i>Night</i>	<i>Night</i>
Ground Floor (1.5m)	0	0	0	0
1 st Floor (4m)	0	0	0	0

Note:

82 dB L_{Amax} was not exceeded during any of the nights during the measurement period.

¹⁴ Based on applied transfer function.

5.5 The measurement period contained meteorological conditions deemed acceptable in accordance with BS 7445: 2003¹⁵.

5.5.1 Meteorological Conditions

Day of Week	Day/Night	Wind		Rainfall	
		Direction	Speed (m/s)	Amount (mm)	Time (hours)
Thursday	Day	S/SSW	3-4	14	2000 2230
	Night	Calm	-	4	0450 0700
Friday	Day	Calm	-	9	1350 1700
	Night	Calm	-	0	-
Saturday	Day	Calm/SSE	0-1	6	2000 2300
	Night	NE	1	0	-
Sunday	Day	NE	1-3	0	-
	Night	NE	1-2	0	-
Monday	Day	Calm/NE	1	0	-

6.0 DISCUSSION

6.1 Criteria Assessment

6.1.1 Average Internal Noise Levels

A noise insulation scheme should be designed to ensure that internal noise levels meet the ‘reasonable’ standard as laid out on BS 8233: 1999. See paragraph 2.4.

6.1.2 Maximum Internal Noise Levels

A noise insulation scheme should be designed to ensure that maximum internal noise levels do not exceed 45 dB L_{Amax} in bedrooms between 07:00 – 23:00 hours, in accordance with BS 8233: 1999.

¹⁵ British Standard BS 7445-1: 2003. *Description and measurement of environmental noise*. ISBN 0580 43032 4.



6.1.3 External Noise Levels

BS8233: 1999 states: *'In gardens and balconies etc., it is desirable that the steady noise level does not exceed 50 dB $L_{Aeq, 1hr}$ and 55 dB $L_{Aeq, 1hr}$ should be regarded as the upper limit.'*

6.2 Maximum Night Time Noise Levels

6.2.1 It should be recognised that the highest maximum night time noise levels were recorded during Thursday night/Friday morning (18/19th October) coinciding with heavy rainfall.

6.2.2 Sound Planning will not consider the maximum level recorded during the early morning of Friday 19th October due to the likely effect of heavy rain impact on the microphone's weatherproof casing.

6.2.3 The second highest maximum level recorded (73 dB L_{Amax}) will be used in subsequent noise insulation scheme design considerations¹⁶.

6.3 Noise Exposure Categories

6.3.1 Ground Floor

The ground floor would fall into NEC B/C.

6.3.2 1st Floor

At 1st floor level a property would fall into NEC C.

6.3.3 A classification of NEC 'C' would usually necessitate a requirement for powered attenuated mechanical ventilation; enabling adequate ventilation without the need to open windows¹⁷.

¹⁶ Measured under dry conditions.

¹⁷ PPG24 – Planning and noise. PPG24 is a superseded policy.



7.0 NOISE MITIGATION

7.1 Havant Borough Council (HBC) - Internal Noise Targets¹⁸

Internal Noise Target – Room Usage

Room	Day/Night	'Reasonable' Internal Design Target dB $L_{Aeq, T}$
Living Rooms	Day	40
Bedrooms	Night	35

7.2 Noise Insulation Scheme Requirements (Average Noise Levels)

Floor	Room Type	Noise Level at Window dB L_{Aeq}	Internal Target dB L_{Aeq}	Reduction Required (dB)
Ground Floor	Living	64	40	24
1 st Floor	Bed	59	35	24

7.3 Maximum Noise Levels

Target: Internal noise level no greater than 45 dB L_{Amax}

Floor	Room Type	Noise Level at Window dB L_{Amax}	Internal Target dB L_{Aeq}	Reduction Required (dB)
1 st Floor	Bed	73	45	28

¹⁸ Design target requested by Laurent Lemagnen (Havant Environmental Health) - Telephone conversation with Dan Thomas (Sound Planning) 2/11/2012.

7.4 Recommended Glazing

Floor	Room Type	Reduction Required (dB)	Pilkington Glazing Meeting Requirement	Performance ¹⁹ R _{TRA} dB(A)
Ground Floor	Living	24	4/12/4	25
1 st Floor	Bed ²⁰	28	10/12/4	29

Notes:

R_{TRA} Traffic Noise Reduction (Pilkington Glass)

7.6 Ventilation

7.6.1 Ventilation Requirements

The additional means of ventilation shall be sufficient to maintain comfortable conditions in summer, without the need to open windows. PPG24 would usually recommend attenuated mechanical ventilation when a room falls into NEC 'C'.

7.6.2 Mechanical Ventilation

Floor	Room Type	NEC	Attenuated Mechanical Ventilation Required?
Ground Floor	Living	B/C	DISCRETIONARY
1 st Floor	Bed	C	YES

The supply air intake for the mechanical ventilation should be located at the façade facing away from the A27.

¹⁹ Source – Pilkington Glass.

²⁰ Based on maximum levels.



7.6.3 Performance

Passivent AV+ has built in duct attenuation to provide the requisite internal noise level for areas where external noise falls into NEC 'C'. See APPENDIX 6.

7.6.4 Mechanical Ventilation Suppliers:

(1) Passivent:	Passivent AV ⁺	Tel: 0161 9627113
(2) Greenwood:	MA3051	Tel: 01903 777135

7.6.5 Passive Ventilation

If it is not deemed necessary to install mechanical ventilation, passive ventilation such as trickle vents or through-wall vents achieving a sound reduction of 25 dB $D_{n,e,w}$ (ground floor) and 29 dB $D_{n,e,w}$ (1st floor) will meet internal noise level targets.

7.7 External Noise Levels

7.7.1 Existing Levels

The existing external daytime noise levels are 61 – 64 dB L_{Aeq} ; in order to reduce external levels down to 50 – 55 dB L_{Aeq} a 10 dB noise reduction would be required.

7.7.2 Acoustic Barriers

Acoustic fencing would need to be installed creating a path difference (noise source to receiver) of 0.1m; due to the elevated section of the A27 is this location, the most practical way of achieving this is a road side barrier running along the A27.

8.0 CONCLUSIONS

- 8.1 The site under investigation is exposed to ambient noise levels of 61 – 64 dB $L_{Aeq, 16hrs}$ during the day time (ground floor level) and 57 - 59 dB $L_{Aeq, 8hrs}$ during the night (1st floor level).



- 8.2 A noise insulation scheme has been specified in section 7.0 of this report, taking into consideration both average (L_{Aeq}) and maximum (L_{Amax}) noise levels.
- 8.3 The noise insulation scheme specifies glazing and ventilation requirements for ground and 1st floors.
- 8.4 It has been recognised that external areas would benefit from an acoustic fence located at the side of the A27 (elevated).



APPENDIX 1

Glossary of Acoustic Terms

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2×10^{-5} pascals) and the threshold of pain is around 120 dB. The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules that transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

Noise Rating

The Noise Rating (NR) system is a set of octave band sound pressure level curves used for specifying limiting values for building services noise. The Noise Criteria (NC) and Preferred Noise Criteria (PNC) systems are similar.

A-weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).



Noise Descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

$L_{Aeq, T}$ *The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.*

L_{AE} *Where the overall noise level over a given period is made up of individual noise events, the $L_{Aeq, T}$ can be predicted by measuring the noise of the individual noise events using the sound exposure level, L_{AE} (or SEL or L_{AX}). It is defined as the level that, if maintained constant for a period of one second, would deliver the same A-weighted sound energy as the actual noise event.*

L_{A10} *The level exceeded for 10% of the time is often used to describe road traffic noise.*

L_{A90} *The level exceeded for 90% of the time is normally used to describe background noise.*

Sound Transmission Descriptors

D_{nT} Standardised level difference

$D_{nT, w}$ Weighted standardised level difference

L_1 The average sound pressure level in the source room

L_2 The average sound pressure level in the receiving room

T Reverberation time (receiving room)

T_0 Reference reverberation time = 0.5s

C_{tr} Adaption spectrum which takes account for low to medium speed road/rail/air traffic; disco music; and factory noise (medium to low frequency noise).

C Adaptation spectrum which takes account of domestic activities including speech, music, radio and television.

R_{TRA} Traffic Noise Reduction



Frequency Analysis

Octave Band	<i>A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000 Hz...</i>
One Third Octave	<i>The logarithmic frequency interval between a lower frequency f_2, when f_2/f_1 equals $2^{1/3}$ apart. Frequencies include: 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000Hz.</i>

Sound Transmission in the Open Air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law.

In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB. Road traffic noise is a notable exception to this rule, as it approximates to a line source, which is represented by the line of the road. The sound energy radiated is inversely proportional to the area of a cylinder centred on the line. In decibel terms, every time the distance from a line source is doubled, the sound pressure level is reduced by 3 dB.

Factors Affecting Sound Transmission in the Open Air

Reflection

When sound waves encounter a hard surface, such as concrete, brickwork, glass, timber or plasterboard, it is reflected from it. As a result, the sound pressure level measured immediately in front of a building façade is approximately 3 dB higher than it would be in the absence of the façade.

Screening and Diffraction

If a solid screen is introduced between a source and receiver, interrupting the sound path, a reduction in sound level is experienced. This reduction is limited, however, by diffraction of the sound energy at the edges of the screen. Screens can provide valuable noise attenuation however. For example, a timber boarded fence built next to a motorway can reduce noise levels on the land beyond, typically by around 10 dB(A). The best results are obtained when a screen is situated close to the source or close to the receiver.

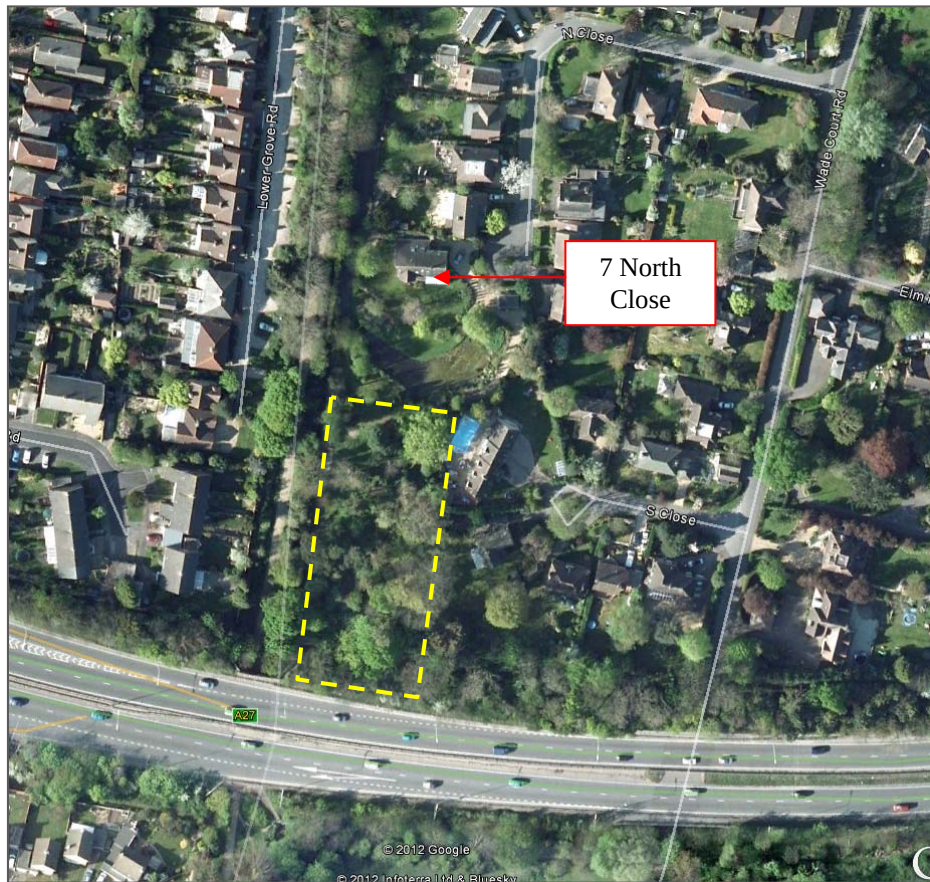


Meteorological Effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradient are variable and difficult to predict.

APPENDIX 2

Site Location



Rear of 7 North Close, Havant

APPENDIX 3

Site Photographs



1.5m Microphone Position – Rear of 7 North Close



4m Microphone Position – Rear of 7 North Close



APPENDIX 4

Ambient Noise Levels

Period	Date	Time	L _{Smax}	L _{Smin}	L _{eq}	L _{S10}	L _{S90}	10 ^{^(L_{Aeq}/10)}
			dB, (A)	dB, (A)	dB, (A)	dB, (A)	dB, (A)	
1	18/10/2012	11:00:00	70.3	58.2	64.2	66	61.5	2630268
2	18/10/2012	11:15:00	68.1	57.3	63.6	65.5	61	2290867.7
3	18/10/2012	11:30:00	67.7	58.5	63.6	65.5	61	2290867.7
4	18/10/2012	11:45:00	68.1	59.7	64.2	66	62	2630268
5	18/10/2012	12:00:00	67.8	57.2	63.6	65.5	61	2290867.7
6	18/10/2012	12:15:00	66.8	57.7	63.5	65	61	2238721.1
7	18/10/2012	12:30:00	67.2	51.8	63.3	65	60.5	2137962.1
8	18/10/2012	12:45:00	69.8	58	63.6	65.5	61	2290867.7
9	18/10/2012	13:00:00	67.9	56.6	63.3	65	60.5	2137962.1
10	18/10/2012	13:15:00	68	56.7	63.4	65.5	60.5	2187761.6
11	18/10/2012	13:30:00	67.7	57.4	63.3	65	61	2137962.1
12	18/10/2012	13:45:00	67.4	57.6	63.6	65	61.5	2290867.7
13	18/10/2012	14:00:00	67.4	57	63.5	65.5	61	2238721.1
14	18/10/2012	14:15:00	67.4	57.2	63.8	65.5	61	2398832.9
15	18/10/2012	14:30:00	71.4	58.7	63.8	65.5	61.5	2398832.9
16	18/10/2012	14:45:00	67.2	55.8	63.5	65.5	60.5	2238721.1
17	18/10/2012	15:00:00	67.6	57.4	63.5	65.5	60.5	2238721.1
18	18/10/2012	15:15:00	67.2	57.8	63.5	65	61	2238721.1
19	18/10/2012	15:30:00	67.8	58.8	63.9	65.5	61.5	2454708.9
20	18/10/2012	15:45:00	67.5	58	64.2	66	61.5	2630268
21	18/10/2012	16:00:00	67.4	59.8	64.2	66	62	2630268
22	18/10/2012	16:15:00	67.1	59.4	64.5	66	62	2818382.9
23	18/10/2012	16:30:00	69	60	64.7	66	62.5	2951209.2
24	18/10/2012	16:45:00	67.9	58.6	64.6	66	62.5	2884031.5
25	18/10/2012	17:00:00	67.5	58.8	64.7	66	62.5	2951209.2
26	18/10/2012	17:15:00	67.8	59.7	65	66.5	63	3162277.7
27	18/10/2012	17:30:00	67.8	59.7	65	66.5	63	3162277.7
28	18/10/2012	17:45:00	67.5	58.4	64.4	66	62	2754228.7
29	18/10/2012	18:00:00	67.6	58.4	64.3	66	62.5	2691534.8
30	18/10/2012	18:15:00	72	58.7	64	65.5	61.5	2511886.4
31	18/10/2012	18:30:00	66.9	55.2	63	64.5	60	1995262.3
32	18/10/2012	18:45:00	66.5	55.6	62.9	64.5	60.5	1949844.6
33	18/10/2012	19:00:00	67.5	56.1	62.6	64.5	60	1819700.9
34	18/10/2012	19:15:00	67.5	55.6	62.6	64.5	59.5	1819700.9
35	18/10/2012	19:30:00	66	54	61.3	63.5	58.5	1348962.9



36	18/10/2012	19:45:00	76.5	56.2	64.7	68	60	2951209.2
37	18/10/2012	20:00:00	69	53.2	61.8	64	58.5	1513561.2
38	18/10/2012	20:15:00	67.5	54.7	61.5	63.5	58.5	1412537.5
39	18/10/2012	20:30:00	70.9	54.3	62.5	65	58.5	1778279.4
40	18/10/2012	20:45:00	69	52.7	61.5	64	57.5	1412537.5
41	18/10/2012	21:00:00	72.2	53.3	62.7	66	57.5	1862087.1
42	18/10/2012	21:15:00	66	51.2	60.7	63.5	55.5	1174897.6
43	18/10/2012	21:30:00	67.9	48.5	59.9	62.5	54.5	977237.22
44	18/10/2012	21:45:00	66	43.2	59.4	63	50	870963.59
45	18/10/2012	22:00:00	65	48.2	59.1	62	53.5	812830.52
46	18/10/2012	22:15:00	64.8	47.7	58.3	62	52	676082.98
47	18/10/2012	22:30:00	65.7	45.2	58.1	61.5	50	645654.23
48	18/10/2012	22:45:00	64.4	44.9	57.5	61	49.5	562341.33
					63.2	dB L _{Aeq}		2093620.2
49	18/10/2012	23:00:00	65.3	44.4	57.3	61	49.5	537031.8
50	18/10/2012	23:15:00	64.7	43.6	56.8	60.5	47	478630.09
51	18/10/2012	23:30:00	63.7	44	55.8	59.5	47	380189.4
52	18/10/2012	23:45:00	65.6	40	55.1	59.5	44	323593.66
53	18/10/2012	00:00:00	63.9	38.9	54.1	58.5	42.5	257039.58
54	19/10/2012	00:15:00	64	38.8	54.6	58.5	42.5	288403.15
55	19/10/2012	00:30:00	64.1	38.4	53.5	58	40.5	223872.11
56	19/10/2012	00:45:00	62.2	37.5	51.5	55.5	40.5	141253.75
57	19/10/2012	01:00:00	65	36.3	52.1	56.5	37.5	162181.01
58	19/10/2012	01:15:00	78.2	36.9	54.9	58	38	309029.54
59	19/10/2012	01:30:00	70.8	42.4	55.4	58.5	47	346736.85
60	19/10/2012	01:45:00	64.3	39.4	50.9	54.5	41.5	123026.88
61	19/10/2012	02:00:00	62.7	38.7	51.3	55.5	42	134896.29
62	19/10/2012	02:15:00	62.4	38.3	51.2	55.5	40.5	131825.67
63	19/10/2012	02:30:00	63.2	37.3	51.1	56	38	128824.96
64	19/10/2012	02:45:00	62.1	36.7	50.3	55	38	107151.93
65	19/10/2012	03:00:00	63	37.3	51.4	56.5	39	138038.43
66	19/10/2012	03:15:00	64	36.5	49.5	54	37.5	89125.094
67	19/10/2012	03:30:00	63	37	50.2	54	38.5	104712.85
68	19/10/2012	03:45:00	64.5	36.8	51.4	55	38.5	138038.43
69	19/10/2012	04:00:00	61.9	36.6	51.1	56	38.5	128824.96
70	19/10/2012	04:15:00	63.3	37.1	52.9	57.5	41.5	194984.46
71	19/10/2012	04:30:00	64.4	38.6	54.5	59	43.5	281838.29
72	19/10/2012	04:45:00	64	40.4	54	58.5	43.5	251188.64
73	19/10/2012	05:00:00	64.4	44.5	57.2	60.5	49	524807.46



74	19/10/2012	05:15:00	67.5	43	58.1	62	47.5	645654.23
75	19/10/2012	05:30:00	65.2	45.4	58.8	62	51.5	758577.58
76	19/10/2012	05:45:00	66.3	46.1	59.8	63	54	954992.59
77	19/10/2012	06:00:00	66.3	47.4	61.4	64	57	1380384.3
78	19/10/2012	06:15:00	67.5	55.3	62.6	64.5	59.5	1819700.9
79	19/10/2012	06:30:00	67.2	54	63.1	65.5	59	2041737.9
80	19/10/2012	06:45:00	67.6	55.5	64.1	66	61.5	2570395.8
					57.0	dB L _{Aeq}		503021.52
81	19/10/2012	07:00:00	67.6	57.9	64.7	66.5	61.5	2951209.2
82	19/10/2012	07:15:00	67.7	59.2	64.9	66.5	62.5	3090295.4
83	19/10/2012	07:30:00	68.7	59.9	65.3	66.5	63	3388441.6
84	19/10/2012	07:45:00	67.7	58.3	65	66.5	62.5	3162277.7
85	19/10/2012	08:00:00	68.1	59.2	65.4	67	63	3467368.5
86	19/10/2012	08:15:00	67.6	58.3	64.9	66.5	62.5	3090295.4
87	19/10/2012	08:30:00	68.3	58.9	64.8	66.5	62	3019951.7
88	19/10/2012	08:45:00	68.3	56.9	64.3	66	61	2691534.8
89	19/10/2012	09:00:00	67.8	56.4	64.1	66	61	2570395.8
90	19/10/2012	09:15:00	67.4	58.2	64.2	66.5	61	2630268
91	19/10/2012	09:30:00	67.4	58.4	64	65.5	61.5	2511886.4
92	19/10/2012	09:45:00	67.5	57	64.1	66	61.5	2570395.8
93	19/10/2012	10:00:00	68	56.8	64.3	66	61.5	2691534.8
94	19/10/2012	10:15:00	68.5	57.9	64	66	61	2511886.4
95	19/10/2012	10:30:00	67.6	57.1	64	66	61	2511886.4
96	19/10/2012	10:45:00	68.1	58.3	64	65.5	61.5	2511886.4
97	19/10/2012	11:00:00	68.9	52.1	63.9	66	60.5	2454708.9
98	19/10/2012	11:15:00	72.5	56.5	64.1	66	61	2570395.8
99	19/10/2012	11:30:00	71.6	57.4	64.2	66	61.5	2630268
100	19/10/2012	11:45:00	68.4	58	64.1	66	61.5	2570395.8
101	19/10/2012	12:00:00	67.3	56.4	63.9	65.5	61.5	2454708.9
102	19/10/2012	12:15:00	67.6	59.1	64.1	65.5	62	2570395.8
103	19/10/2012	12:30:00	67.1	56.3	64.1	66	61	2570395.8
104	19/10/2012	12:45:00	67.5	58.2	64	66	61.5	2511886.4
105	19/10/2012	13:00:00	67.4	58.6	64.2	66	61.5	2630268
106	19/10/2012	13:15:00	67.7	58.3	64.4	66	61.5	2754228.7
107	19/10/2012	13:30:00	67.6	57.3	64.3	66	61.5	2691534.8
108	19/10/2012	13:45:00	72.9	59.1	64.6	66	62.5	2884031.5
109	19/10/2012	14:00:00	67.4	57.4	64.5	66	62.5	2818382.9
110	19/10/2012	14:15:00	67.5	60	64.2	65.5	62	2630268
111	19/10/2012	14:30:00	67.5	55	64.5	66	62	2818382.9



112	19/10/2012	14:45:00	67.6	59.1	64.2	65.5	62	2630268
113	19/10/2012	15:00:00	67.6	59.1	64.7	66	62.5	2951209.2
114	19/10/2012	15:15:00	67.8	58.7	64.8	66	63	3019951.7
115	19/10/2012	15:30:00	74.4	57.9	65.8	67.5	63.5	3801894
116	19/10/2012	15:45:00	70.6	59.6	64.5	66	62.5	2818382.9
117	19/10/2012	16:00:00	67.1	60.3	64.5	65.5	63	2818382.9
118	19/10/2012	16:15:00	68.5	60.8	64.6	66	63	2884031.5
119	19/10/2012	16:30:00	66.9	60.6	64.7	66	63	2951209.2
120	19/10/2012	16:45:00	67.5	58.6	64.7	66	63	2951209.2
121	19/10/2012	17:00:00	67.6	59.7	64.8	66	63	3019951.7
122	19/10/2012	17:15:00	68.1	57.2	65.1	66.5	63.5	3235936.6
123	19/10/2012	17:30:00	67.8	60	64.7	66	63	2951209.2
124	19/10/2012	17:45:00	72	57.5	64.7	66	62.5	2951209.2
125	19/10/2012	18:00:00	68	59.2	64.6	66	62	2884031.5
126	19/10/2012	18:15:00	67.4	58.8	64.2	65.5	62	2630268
127	19/10/2012	18:30:00	67.9	58.2	63.8	65.5	61	2398832.9
128	19/10/2012	18:45:00	67.4	56.8	63.8	65.5	61	2398832.9
129	19/10/2012	19:00:00	67.1	55.6	63.3	65.5	60.5	2137962.1
130	19/10/2012	19:15:00	66.9	56.3	63.1	65.5	59.5	2041737.9
131	19/10/2012	19:30:00	66.4	53.9	62.3	64.5	59	1698243.7
132	19/10/2012	19:45:00	68	52	61.8	64	58	1513561.2
133	19/10/2012	20:00:00	66.5	52.4	62.1	64.5	58	1621810.1
134	19/10/2012	20:15:00	67	52.4	61.9	64.5	57.5	1548816.6
135	19/10/2012	20:30:00	66.4	50.5	61.1	63.5	56.5	1288249.6
136	19/10/2012	20:45:00	66	50.2	60.6	63	56	1148153.6
137	19/10/2012	21:00:00	66.3	51.6	60.3	63	56	1071519.3
138	19/10/2012	21:15:00	66.5	52.5	60.3	63	56	1071519.3
139	19/10/2012	21:30:00	67	52.9	60.7	63	56.5	1174897.6
140	19/10/2012	21:45:00	65.2	46.2	59.2	62	53	831763.77
141	19/10/2012	22:00:00	65.7	48.4	59.6	62.5	54.5	912010.84
142	19/10/2012	22:15:00	66.4	48.5	58.6	61.5	53.5	724435.96
143	19/10/2012	22:30:00	64.9	47.2	59.2	62.5	53	831763.77
144	19/10/2012	22:45:00	65.6	48.2	57.9	60.5	53	616595
					63.8	dB L _{Aeq}		2413462.8
145	19/10/2012	23:00:00	65.8	45.4	58	61	51	630957.34
146	19/10/2012	23:15:00	65.2	43.5	57.6	61	50.5	575439.94
147	19/10/2012	23:30:00	66	45.7	57.4	60.5	51	549540.87
148	19/10/2012	23:45:00	64.5	42.4	56.7	60	49.5	467735.14
149	19/10/2012	00:00:00	64.9	41.8	56.7	60.5	47	467735.14



150	20/10/2012	00:15:00	64.8	41.7	56	59.5	48	398107.17
151	20/10/2012	00:30:00	64.9	38.5	56.1	60	45.5	407380.28
152	20/10/2012	00:45:00	62.6	40.5	55.1	59	46.5	323593.66
153	20/10/2012	01:00:00	63.3	36.8	54.2	58.5	43.5	263026.8
154	20/10/2012	01:15:00	63.8	37	53	57.5	40	199526.23
155	20/10/2012	01:30:00	64.1	36.2	53.4	58	41	218776.16
156	20/10/2012	01:45:00	64.3	36	52.6	57	38	181970.09
157	20/10/2012	02:00:00	62.1	35.7	51.4	56	37	138038.43
158	20/10/2012	02:15:00	62.5	36.4	52.2	57	41	165958.69
159	20/10/2012	02:30:00	63.7	36.4	50.1	54	38.5	102329.3
160	20/10/2012	02:45:00	63.8	36.1	52.7	57.5	39.5	186208.71
161	20/10/2012	03:00:00	63.7	36.7	50.9	55	39.5	123026.88
162	20/10/2012	03:15:00	65.2	36	52	56.5	37.5	158489.32
163	20/10/2012	03:30:00	65.7	37.3	52.9	57.5	40	194984.46
164	20/10/2012	03:45:00	62.9	38	51.5	56	40.5	141253.75
165	20/10/2012	04:00:00	63.9	37.5	50.7	54.5	39	117489.76
166	20/10/2012	04:15:00	63	37.5	52	57.5	39	158489.32
167	20/10/2012	04:30:00	63.6	37.6	53	58	39.5	199526.23
168	20/10/2012	04:45:00	64.4	38.1	53.9	58.5	40	245470.89
169	20/10/2012	05:00:00	63.4	38.1	53.5	58.5	40.5	223872.11
170	20/10/2012	05:15:00	64.8	38.8	54.1	58	41.5	257039.58
171	20/10/2012	05:30:00	65.8	39.1	55.8	60	43.5	380189.4
172	20/10/2012	05:45:00	65.3	39.3	56.1	60	45	407380.28
173	20/10/2012	06:00:00	66.1	39.9	56.9	61	44.5	489778.82
174	20/10/2012	06:15:00	66.7	42.4	58.3	61.5	49	676082.98
175	20/10/2012	06:30:00	65.6	45.7	58.9	62	52.5	776247.12
176	20/10/2012	06:45:00	67.3	46.3	59.6	62.5	53.5	912010.84
					55.3	dB L _{Aeq}		335551.74
177	20/10/2012	07:00:00	67.1	49.9	59.5	62.5	54	891250.94
178	20/10/2012	07:15:00	65.7	49.8	60.3	63	55	1071519.3
179	20/10/2012	07:30:00	66.9	51.3	61	64	56	1258925.4
180	20/10/2012	07:45:00	67.4	53	61.5	64	56.5	1412537.5
181	20/10/2012	08:00:00	67.7	52.6	62.6	65	59	1819700.9
182	20/10/2012	08:15:00	66.6	55.4	62.3	64.5	59.5	1698243.7
183	20/10/2012	08:30:00	67.4	52.8	62.6	65	58.5	1819700.9
184	20/10/2012	08:45:00	66.5	52.1	62.4	65	59	1737800.8
185	20/10/2012	09:00:00	67.1	56.4	63	65	59.5	1995262.3
186	20/10/2012	09:15:00	66.8	58.2	63.2	65	60.5	2089296.1
187	20/10/2012	09:30:00	75.2	55.6	63.5	65.5	60	2238721.1



188	20/10/2012	09:45:00	67.4	56.7	63.8	65.5	60.5	2398832.9
189	20/10/2012	10:00:00	68	57.1	63.6	65.5	61	2290867.7
190	20/10/2012	10:15:00	66.8	55.7	63.3	65	61	2137962.1
191	20/10/2012	10:30:00	66.8	56.9	63.6	65	61	2290867.7
192	20/10/2012	10:45:00	67	58.6	63.8	65.5	61.5	2398832.9
193	20/10/2012	11:00:00	66.5	58.7	63.8	65.5	61	2398832.9
194	20/10/2012	11:15:00	67.6	57.5	63.9	65.5	61.5	2454708.9
195	20/10/2012	11:30:00	67.3	54.9	63.7	65.5	61.5	2344228.8
196	20/10/2012	11:45:00	67.5	55.5	63.4	65	61	2187761.6
197	20/10/2012	12:00:00	69.3	56.1	63.4	65	60.5	2187761.6
198	20/10/2012	12:15:00	67.1	54.5	63.3	65	60.5	2137962.1
199	20/10/2012	12:30:00	66.8	56.3	63.1	65	60	2041737.9
200	20/10/2012	12:45:00	67	55	63.1	65	60	2041737.9
201	20/10/2012	13:00:00	67.5	57	63	64.5	60	1995262.3
202	20/10/2012	13:15:00	68.9	56.9	63.2	65	60.5	2089296.1
203	20/10/2012	13:30:00	68.9	56	62.8	64.5	60	1905460.7
204	20/10/2012	13:45:00	66.9	57.2	62.9	64.5	60	1949844.6
205	20/10/2012	14:00:00	67.3	56.6	63	64.5	60.5	1995262.3
206	20/10/2012	14:15:00	70.1	56.8	63	65	60.5	1995262.3
207	20/10/2012	14:30:00	68.2	54.7	63	65	60	1995262.3
208	20/10/2012	14:45:00	67.1	53.3	62.9	65	59.5	1949844.6
209	20/10/2012	15:00:00	66.4	56.6	62.5	64.5	59.5	1778279.4
210	20/10/2012	15:15:00	70.9	54.5	62.9	64.5	60	1949844.6
211	20/10/2012	15:30:00	67	54	62.6	64.5	60	1819700.9
212	20/10/2012	15:45:00	67.4	51.5	62.5	64.5	59	1778279.4
213	20/10/2012	16:00:00	67	54.5	62.7	64.5	59.5	1862087.1
214	20/10/2012	16:15:00	66.7	56.6	62.6	64.5	59.5	1819700.9
215	20/10/2012	16:30:00	67.3	56.3	63.1	65	60.5	2041737.9
216	20/10/2012	16:45:00	71.7	56.1	62.7	64.5	59.5	1862087.1
217	20/10/2012	17:00:00	67.3	56.8	63.2	65	60.5	2089296.1
218	20/10/2012	17:15:00	68.4	55.5	63.3	65	60.5	2137962.1
219	20/10/2012	17:30:00	69	57.3	63.3	65	60.5	2137962.1
220	20/10/2012	17:45:00	68.5	55.9	62.9	64.5	60	1949844.6
221	20/10/2012	18:00:00	66.7	54.5	62.3	64.5	59	1698243.7
222	20/10/2012	18:15:00	72.6	52.1	61.9	64	58	1548816.6
223	20/10/2012	18:30:00	67.8	53.6	61.2	63.5	57.5	1318256.7
224	20/10/2012	18:45:00	66.8	53.1	61.4	63.5	58	1380384.3
225	20/10/2012	19:00:00	66	49.5	61.4	63.5	58	1380384.3
226	20/10/2012	19:15:00	65.3	49.4	60.5	63	55.5	1122018.5
227	20/10/2012	19:30:00	68.6	52.7	60.4	63	56.5	1096478.2
228	20/10/2012	19:45:00	65.4	50.8	59.7	62	55	933254.3
229	20/10/2012	20:00:00	65.3	51.1	59.8	62	55.5	954992.59



230	20/10/2012	20:15:00	66.6	49.4	59.4	62	55.5	870963.59
231	20/10/2012	20:30:00	64	47.2	58.3	61	54.5	676082.98
232	20/10/2012	20:45:00	64.7	49	58.2	60.5	54	660693.45
233	20/10/2012	21:00:00	64.9	48.2	58.7	61.5	54	741310.24
234	20/10/2012	21:15:00	68.2	47.3	58.8	62	54	758577.58
235	20/10/2012	21:30:00	67.9	50.8	59.5	62	55.5	891250.94
236	20/10/2012	21:45:00	72.7	49.8	61	63.5	56	1258925.4
237	20/10/2012	22:00:00	71.9	50.8	60.5	63	56	1122018.5
238	20/10/2012	22:15:00	70	51.3	60.5	63	56	1122018.5
239	20/10/2012	22:30:00	70.4	50	59.6	62.5	54.5	912010.84
240	20/10/2012	22:45:00	74	49.8	60.8	63.5	56	1202264.4
					62.3	dB L _{Aeq}		1689004.3
241	20/10/2012	23:00:00	71.3	50.1	60.2	63	55	1047128.5
242	20/10/2012	23:15:00	70.6	50.4	59.7	62.5	55	933254.3
243	20/10/2012	23:30:00	64.4	46.8	57.7	61	52	588843.66
244	20/10/2012	23:45:00	64	44.3	57.7	61	51.5	588843.66
245	20/10/2012	00:00:00	65.5	41.4	55.9	60	45.5	389045.14
246	21/10/2012	00:15:00	63.7	42.8	56	59.5	47	398107.17
247	21/10/2012	00:30:00	65.4	41.3	56.3	60	46.5	426579.52
248	21/10/2012	00:45:00	63.9	38.2	54.6	59	43	288403.15
249	21/10/2012	01:00:00	64.3	39.8	54.5	59	43	281838.29
250	21/10/2012	01:15:00	63	36.9	52.7	57.5	40.5	186208.71
251	21/10/2012	01:30:00	64.3	37.7	53.7	58.5	40	234422.88
252	21/10/2012	01:45:00	63.1	37.1	52.8	58	40.5	190546.07
253	21/10/2012	02:00:00	62.5	37.6	52	56.5	40	158489.32
254	21/10/2012	02:15:00	61.4	36.6	51	56	38.5	125892.54
255	21/10/2012	02:30:00	62.5	36.7	51.3	56.5	38	134896.29
256	21/10/2012	02:45:00	63.5	37	51.4	56	39	138038.43
257	21/10/2012	03:00:00	61.5	35.7	49.9	55	37	97723.722
258	21/10/2012	03:15:00	62.3	35.9	50.4	55	37.5	109647.82
259	21/10/2012	03:30:00	62	36	50.6	56	37	114815.36
260	21/10/2012	03:45:00	63.2	36.1	50.6	55	38	114815.36
261	21/10/2012	04:00:00	61.9	35.6	51.4	56.5	38	138038.43
262	21/10/2012	04:15:00	64.1	35.7	51.7	56	38	147910.84
263	21/10/2012	04:30:00	63.1	35.4	49.7	54	37	93325.43
264	21/10/2012	04:45:00	62	35.4	50.4	56	37	109647.82
265	21/10/2012	05:00:00	62	35.8	50.1	54.5	38.5	102329.3
266	21/10/2012	05:15:00	64.4	37.4	52.7	57	40	186208.71
267	21/10/2012	05:30:00	62.5	38.5	52.5	57	41.5	177827.94



268	21/10/2012	05:45:00	63.5	40.1	54.5	59	43.5	281838.29
269	21/10/2012	06:00:00	64.9	40.3	55.7	60	44.5	371535.23
270	21/10/2012	06:15:00	64.2	41.6	56.8	60.5	46	478630.09
271	21/10/2012	06:30:00	65.4	41.2	57.5	61.5	48	562341.33
272	21/10/2012	06:45:00	66.6	44.1	59.1	62.5	51	812830.52
					55.0	dB L _{Aeq}		312812.62
273	21/10/2012	07:00:00	66.7	44.6	58.8	62	50.5	758577.58
274	21/10/2012	07:15:00	68.5	47.4	59.9	63	52.5	977237.22
275	21/10/2012	07:30:00	66.6	45.9	59.4	62.5	51.5	870963.59
276	21/10/2012	07:45:00	66.6	45	59.1	62.5	50	812830.52
277	21/10/2012	08:00:00	66.1	43.4	59.2	62.5	52	831763.77
278	21/10/2012	08:15:00	65.9	45.8	59.6	62.5	53.5	912010.84
279	21/10/2012	08:30:00	65.5	48.9	59.4	62.5	54	870963.59
280	21/10/2012	08:45:00	65.9	49.5	59.7	62	55	933254.3
281	21/10/2012	09:00:00	65.8	50.2	59.9	62.5	55.5	977237.22
282	21/10/2012	09:15:00	65.8	48.8	60.6	63	55.5	1148153.6
283	21/10/2012	09:30:00	65.6	50.7	61	63	57.5	1258925.4
284	21/10/2012	09:45:00	68.7	51.8	61.1	63.5	57.5	1288249.6
285	21/10/2012	10:00:00	66.3	52.4	61.7	64	58.5	1479108.4
286	21/10/2012	10:15:00	66.5	54.6	62.3	64.5	59.5	1698243.7
287	21/10/2012	10:30:00	66.7	56.7	62.2	64	59.5	1659586.9
288	21/10/2012	10:45:00	66.2	57.3	62.4	64.5	59.5	1737800.8
289	21/10/2012	11:00:00	66.4	55.2	62.3	64.5	59.5	1698243.7
290	21/10/2012	11:15:00	71.9	57.4	62.9	65	60	1949844.6
291	21/10/2012	11:30:00	66.3	54.2	62.6	64.5	60	1819700.9
292	21/10/2012	11:45:00	67.6	56.1	62.7	64.5	60	1862087.1
293	21/10/2012	12:00:00	66.1	56.1	62.5	64.5	60	1778279.4
294	21/10/2012	12:15:00	66.4	55	62.7	64.5	60	1862087.1
295	21/10/2012	12:30:00	67.3	57.7	63	64.5	60.5	1995262.3
296	21/10/2012	12:45:00	66.3	55.6	62.6	64.5	60	1819700.9
297	21/10/2012	13:00:00	66	56	62.5	64.5	59.5	1778279.4
298	21/10/2012	13:15:00	66	57.1	62.5	64.5	60	1778279.4
299	21/10/2012	13:30:00	66.2	55.1	62.1	64	59	1621810.1
300	21/10/2012	13:45:00	66	53.9	62	64	58.5	1584893.2
301	21/10/2012	14:00:00	74.6	56	62.4	64.5	59.5	1737800.8
302	21/10/2012	14:15:00	66.3	56.9	62	64	59	1584893.2
303	21/10/2012	14:30:00	66.4	57.1	62.1	64	60	1621810.1
304	21/10/2012	14:45:00	66.5	56.4	62.2	64	59.5	1659586.9
305	21/10/2012	15:00:00	67.6	57.2	62.4	64	60	1737800.8



306	21/10/2012	15:15:00	65.7	55.6	62.2	64	59.5	1659586.9
307	21/10/2012	15:30:00	65.7	56.5	62.4	64	59.5	1737800.8
308	21/10/2012	15:45:00	66.8	56.4	62.4	64.5	59.5	1737800.8
309	21/10/2012	16:00:00	66.2	55.1	62.5	64	60	1778279.4
310	21/10/2012	16:15:00	72.3	54.9	62.8	64.5	60	1905460.7
311	21/10/2012	16:30:00	66.4	55.2	62.6	64.5	59.5	1819700.9
312	21/10/2012	16:45:00	66.2	54.9	62.5	64.5	59.5	1778279.4
313	21/10/2012	17:00:00	65.9	54.9	62.6	64.5	60	1819700.9
314	21/10/2012	17:15:00	66.8	56.4	62.8	64.5	60.5	1905460.7
315	21/10/2012	17:30:00	67.9	53.1	62.3	64.5	59.5	1698243.7
316	21/10/2012	17:45:00	65.6	55.4	62.1	64	59	1621810.1
317	21/10/2012	18:00:00	65.8	50.5	61.4	63.5	57	1380384.3
318	21/10/2012	18:15:00	66	53	61.5	64	58	1412537.5
319	21/10/2012	18:30:00	66.7	51.1	61	63	57	1258925.4
320	21/10/2012	18:45:00	67	50.4	60.8	63.5	56	1202264.4
321	21/10/2012	19:00:00	68.5	52.8	60.9	63.5	57	1230268.8
322	21/10/2012	19:15:00	64.8	49.1	60.2	62.5	55.5	1047128.5
323	21/10/2012	19:30:00	65.3	52	59.8	62.5	55.5	954992.59
324	21/10/2012	19:45:00	68.5	50.9	59.8	62.5	55	954992.59
325	21/10/2012	20:00:00	65.8	49.9	60	62.5	55.5	1000000
326	21/10/2012	20:15:00	65.3	51.2	59.4	62	55	870963.59
327	21/10/2012	20:30:00	65.4	48.2	59	62	53	794328.23
328	21/10/2012	20:45:00	64.5	42.9	58.2	61.5	52	660693.45
329	21/10/2012	21:00:00	65.1	46.1	57.9	61	51.5	616595
330	21/10/2012	21:15:00	64.2	44.4	57.6	61	50.5	575439.94
331	21/10/2012	21:30:00	64.3	42.5	56.7	60.5	49	467735.14
332	21/10/2012	21:45:00	63.6	41.5	56.1	59.5	48	407380.28
333	21/10/2012	22:00:00	64.2	40	55.1	59	45	323593.66
334	21/10/2012	22:15:00	64.6	41	55.7	59.5	46.5	371535.23
335	21/10/2012	22:30:00	62.5	41.5	54.8	58	46.5	301995.17
336	21/10/2012	22:45:00	65.1	39.8	56	60	45.5	398107.17
					61.2	dB L _{Aeq}		1309332.1
337	21/10/2012	23:00:00	62.5	39.1	53.9	58	43.5	245470.89
338	21/10/2012	23:15:00	64.5	37.6	53.8	58	43	239883.29
339	21/10/2012	23:30:00	62.9	38.2	53.3	57.5	41.5	213796.21
340	21/10/2012	23:45:00	63	37.8	52.6	57	41.5	181970.09
341	21/10/2012	00:00:00	62.8	36.7	52	56.5	40.5	158489.32
342	22/10/2012	00:15:00	64	37.6	52.5	56.5	41.5	177827.94
343	22/10/2012	00:30:00	63.4	37.7	52.4	57	40.5	173780.08

344	22/10/2012	00:45:00	61.8	35.6	49.8	54.5	37	95499.259
345	22/10/2012	01:00:00	62.7	35.6	50.4	55.5	36.5	109647.82
346	22/10/2012	01:15:00	61	35.4	47.7	52	36.5	58884.366
347	22/10/2012	01:30:00	61.3	34.6	46	49.5	35.5	39810.717
348	22/10/2012	01:45:00	60.7	34.7	46.7	50.5	35.5	46773.514
349	22/10/2012	02:00:00	60.6	34.4	46.1	50	35.5	40738.028
350	22/10/2012	02:15:00	60.6	34.6	46.3	50.5	36	42657.952
351	22/10/2012	02:30:00	61.1	34.6	47.9	51.5	36	61659.5
352	22/10/2012	02:45:00	61.9	34.9	47.5	51.5	35.5	56234.133
353	22/10/2012	03:00:00	62	35.1	46.6	50	36	45708.819
354	22/10/2012	03:15:00	62.5	34.8	48.4	52.5	36	69183.097
355	22/10/2012	03:30:00	62.7	34.9	49.3	54	36	85113.804
356	22/10/2012	03:45:00	61.9	35	49	53	36	79432.823
357	22/10/2012	04:00:00	62.8	35.2	50.3	54	36.5	107151.93
358	22/10/2012	04:15:00	61.9	35.3	49.5	54.5	36.5	89125.094
359	22/10/2012	04:30:00	62.4	36.4	51.1	56	38.5	128824.96
360	22/10/2012	04:45:00	62.9	38.7	54	58.5	41	251188.64
361	22/10/2012	05:00:00	63.5	40.6	54.9	59	44	309029.54
362	22/10/2012	05:15:00	65.5	43.4	57.6	61	48.5	575439.94
363	22/10/2012	05:30:00	64.6	44.3	57.6	61	51	575439.94
364	22/10/2012	05:45:00	64.2	46.4	58.3	61.5	53	676082.98
365	22/10/2012	06:00:00	65.7	49.3	60.4	63	55	1096478.2
366	22/10/2012	06:15:00	66.1	49.1	61.7	64	57	1479108.4
367	22/10/2012	06:30:00	67.1	54.3	62.7	64.5	58.5	1862087.1
368	22/10/2012	06:45:00	67	54.4	63.1	65	60	2041737.9
					55.5	dB L _{Aeq}		356695.51
369	22/10/2012	07:00:00	67.2	56.7	63.7	65.5	61	2344228.8
370	22/10/2012	07:15:00	67.2	58.1	63.9	65.5	61.5	2454708.9
371	22/10/2012	07:30:00	67.2	58.1	63.9	65.5	61.5	2454708.9
372	22/10/2012	07:45:00	67	54.4	63.5	65.5	60.5	2238721.1
373	22/10/2012	08:00:00	66.7	56.3	63.4	65	60.5	2187761.6
374	22/10/2012	08:15:00	66.1	52.1	62.6	64.5	59.5	1819700.9
375	22/10/2012	08:30:00	68.5	49.2	62.9	65	59.5	1949844.6
376	22/10/2012	08:45:00	67.7	58	63.3	65	60.5	2137962.1
377	22/10/2012	09:00:00	67.7	56.1	63.8	65.5	61	2398832.9
378	22/10/2012	09:15:00	69	55	63	65	60	1995262.3
379	22/10/2012	09:30:00	67.3	54.5	62.6	65	59.5	1819700.9
380	22/10/2012	09:45:00	66.7	52.6	62.5	64.5	59	1778279.4
381	22/10/2012	10:00:00	66.3	55.8	62.5	64.5	60	1778279.4



382	22/10/2012	10:15:00	66.6	55.5	62.4	64.5	59	1737800.8
383	22/10/2012	10:30:00	80.1	55.8	62.9	64.5	60	1949844.6
384	22/10/2012	10:45:00	66.3	55.9	62.5	64.5	59.5	1778279.4
385	22/10/2012	11:00:00	67.8	53	62.5	64.5	59.5	1778279.4
386	22/10/2012	11:15:00	67	54.8	62.3	64.5	59.5	1698243.7
387	22/10/2012	11:30:00	71.3	52.8	62.6	64.5	59.5	1819700.9
388	22/10/2012	11:45:00	68	55.1	62.4	64.5	59	1737800.8
389	22/10/2012	12:00:00	66.8	54	62.7	64.5	60	1862087.1
390	22/10/2012	12:15:00	72.8	55.5	63	64.5	60	1995262.3
391	22/10/2012	12:30:00	71.3	55.8	62.7	64.5	59.5	1862087.1
392	22/10/2012	12:45:00	71.4	55.2	62.7	64.5	59.5	1862087.1
393	22/10/2012	13:00:00	67	56.5	62.6	64.5	60	1819700.9
394	22/10/2012	13:15:00	73.5	55.2	62.6	64.5	59.5	1819700.9
395	22/10/2012	13:30:00	73.1	52.3	62.8	64.5	60	1905460.7
396	22/10/2012	13:45:00	70.8	56.6	62.4	64	59.5	1737800.8
397	22/10/2012	14:00:00	68.9	55.2	62.5	64.5	59.5	1778279.4
398	22/10/2012	14:15:00	65.9	54.5	62.2	64	59	1659586.9
399	22/10/2012	14:30:00	66.2	53.9	62	64	59	1584893.2
400	22/10/2012	14:45:00	65.8	56	62.3	64	59.5	1698243.7
401	22/10/2012	15:00:00	67.9	53.5	62	64	59	1584893.2
402	22/10/2012	15:15:00	66.6	55.9	62.1	64	58.5	1621810.1
403	22/10/2012	15:30:00	70	54.7	62.6	64.5	60	1819700.9
404	22/10/2012	15:45:00	66	54.9	62.6	64	60	1819700.9
405	22/10/2012	16:00:00	66.8	57.3	62.6	64.5	60	1819700.9
406	22/10/2012	16:15:00	74.5	56.3	63.8	65.5	61	2398832.9
407	22/10/2012	16:30:00	67.2	56.3	62.7	64.5	60.5	1862087.1
408	22/10/2012	16:45:00	66.3	56	62.8	64.5	60.5	1905460.7
409	22/10/2012	17:00:00	66.1	56.8	62.8	64.5	60.5	1905460.7
410	22/10/2012	17:15:00	66.8	57.6	63	64.5	61	1995262.3
411	22/10/2012	17:30:00	69.5	54.1	63	64.5	60.5	1995262.3
412	22/10/2012	17:45:00	66	55.5	62.7	64	60.5	1862087.1
413	22/10/2012	18:00:00	69.1	57.3	62.7	64.5	60	1862087.1
414	22/10/2012	18:15:00	65.8	52	62	64	59	1584893.2
415	22/10/2012	18:30:00	88.1	54.4	66.1	64.5	58.5	4073802.8
416	22/10/2012	18:45:00	66.4	53.3	61.1	63	57.5	1288249.6
417	22/10/2012	19:00:00	65.6	48.6	60.4	63	56	1096478.2
418	22/10/2012	19:15:00	65.5	48.5	59.8	62.5	55	954992.59
419	22/10/2012	19:30:00	64.7	45.6	59.3	62	53.5	851138.04
420	22/10/2012	19:45:00	64.3	45.3	59.1	62	53.5	812830.52
421	22/10/2012	20:00:00	65.6	47.3	58.8	61.5	53	758577.58
422	22/10/2012	20:15:00	64.2	44.3	57.9	60.5	52	616595
423	22/10/2012	20:30:00	64.6	42.2	57.4	60.5	50.5	549540.87



soundplanning

424	22/10/2012	20:45:00	63	45.2	57.4	60.5	50.5	549540.87
425	22/10/2012	21:00:00	65	44	56.9	60	50.5	489778.82
426	22/10/2012	21:15:00	63.9	44.8	57.3	60.5	51	537031.8
427	22/10/2012	21:30:00	65.4	37.2	56.2	59.5	48	416869.38
428	22/10/2012	21:45:00	63	40.1	56	59.5	48	398107.17
429	22/10/2012	22:00:00	62.9	40.6	56.2	59.5	47	416869.38
430	22/10/2012	22:15:00	63.8	38.4	55.6	59.5	45	363078.05
431	22/10/2012	22:30:00	63.1	37.7	54.2	58.5	43	263026.8
					62.1	dB L _{Aeq}		1617728.2



APPENDIX 5

Transfer Function

	Microphone Height		Diff
	1.5m	4m	
Hz	dB	dB	dB
Band	L _{eq}	L _{eq}	L _{eq}
Z	71	71.9	+0.9
C	68.6	68.6	0
A	62.9	64.4	+1.5
16	64.4	65.3	+0.9
32	63.6	63	-0.6
63	64.9	62.5	-2.4
125	57.9	55.9	-2
250	53.4	58.8	+5.4
500	57.6	59.3	+1.7
1k	61.5	62.7	+1.2
2k	52.5	54.2	+1.7
4k	40.3	40.8	+0.5
8k	40.6	39.8	-0.8
16k	40.3	38.6	-1.7

APPENDIX 6

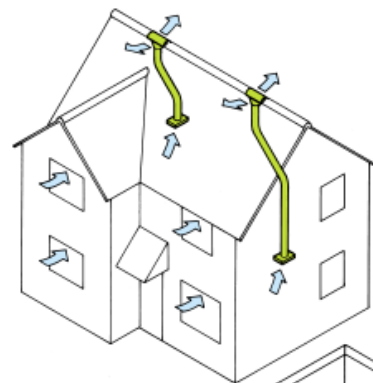
Attenuated Mechanical Ventilation

Passivent

Passivent Solutions

Passivent PSV: for Categories A - B

Passivent PSV (passive stack ventilation) is a non-electrical stack-effect system which provides continuous gentle extraction from kitchens and bathrooms. It is preferable to wall fans because ducted extraction through the roof means no noise from outside and no fan noise. Acoustically treated wall or window vents in habitable rooms replace the extracted air. Automatic control related to room humidity is also possible.

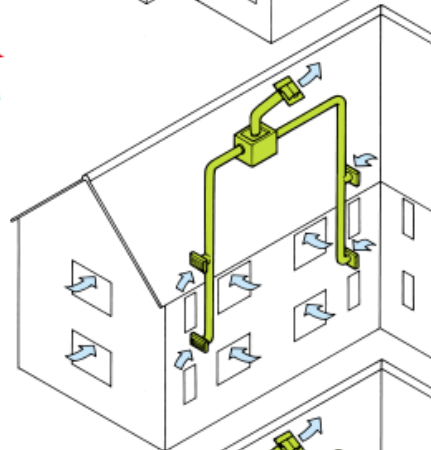


Passivent AV: for Categories B - C

Passivent AV (assisted ventilation) whole-house systems provide a discreet alternative to acoustic boxes; in many cases there is no visible acoustic treatment.

This is a fan-assisted system developed from PSV, and typically includes:

- Acoustically treated wall or window inlets in habitable rooms
- A ducted extraction system from the kitchen and bathroom to a roof terminal, via a single low-energy continuously-running fan in the roof space.

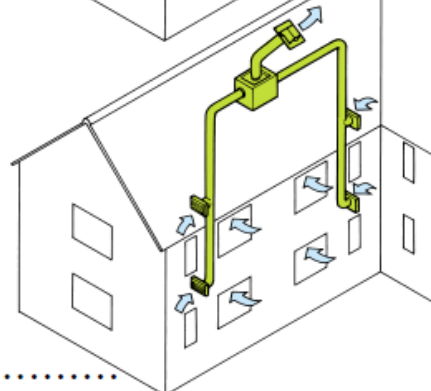


Passivent AV+: for Category C

Passivent AV+ systems are similar to Passivent AV with additional acoustic treatment, possibly including:

- Acoustic wall inlets in 'wet' rooms (kitchen and bathroom)
- Extracts in habitable rooms adjacent to noise source
- Acoustically treated ductwork with boosted extraction.

Passivent Limited offer a free comprehensive design service



APPENDIX 7

Glazing Performance

Pilkington

Table 2 – Pilkington **Insulight**™

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)																					
	4/12/4		6/12/6		6/12/6.4 PVB		10/12/4		10/12/6		10/12/6.4 PVB		Pilkington Acoustic Laminate									
													6/12/7		6/12/11		10/12/16		13/12/13		16/12/16	
100	25		17		19		23		27		27		25		26		26		30		31	
125	24	24	26	20	24	21	28	25	27	26	28	27	27	26	25	26	28	27	27	28	34	32
160	23		22		21		26		24		26		26		25		26		27		33	
200	21		18		19		19		24		26		23		25		24		31		34	
250	21	20	18	19	19	20	23	22	29	27	30	29	24	25	28	28	28	27	38	34	38	37
315	19		24		24		26		31		32		28		32		31		39		39	
400	22		27		28		31		33		34		30		35		34		41		43	
500	25	25	29	29	32	31	33	33	34	34	36	36	34	33	39	38	38	37	44	44	46	45
630	30		33		34		36		37		40		37		43		41		48		48	
800	33		37		38		39		39		41		42		46		44		51		50	
1000	36	35	39	38	40	39	41	40	41	40	42	41	45	44	47	47	45	45	53	52	48	46
1250	38		39		40		41		41		41		46		47		46		52		43	
1600	40		39		39		41		39		41		46		46		44		49		43	
2000	41	38	34	36	35	37	45	43	37	38	42	42	45	46	43	43	42	44	45	47	46	46
2500	35		37		39		45		40		44		48		42		44		48		50	
3150	31		42		44		42		43		49		51		47		51		52		53	
4000	40	35	47	45	49	47	44	44	47	46	53	52	52	52	54	51	56	54	57	55	59	57
R _m (dB)	29		30		31		34		34		36		36		37		39		42		42	
R _w (dB)	31		33		34		36		38		40		38		41		42		45		46	
R _{TRA} (dBA)	25		26		27		29		32		34		31		33		37		38		41	